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— *of inventorship (Rule 4.17(iv)) for US only*

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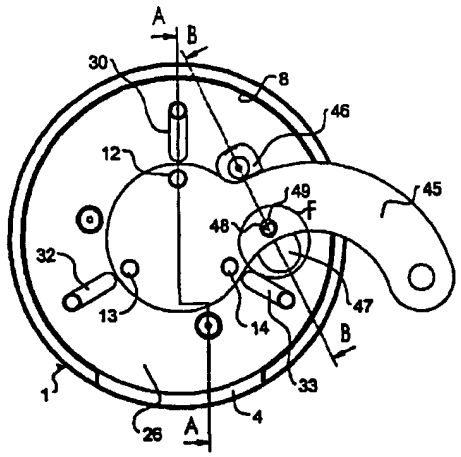
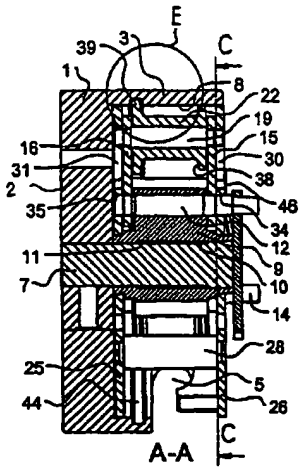
(54) Title: HOSE PUMP





(57) Abstract: A hose pump comprises a housing (1) with a circularly curving wall surface (8) and a rotatable support means (9) carrying a plurality of rollers (22, 23, 24), where said support means is adapted to press said rollers (22, 23, 24) against the circular wall surface (8) and to cause said rollers (22, 23, 24) to propel a fluid through a hose, a length of said hose being arranged between the wall surface (8) and the rollers (22, 23, 24). The support means (9) of the rollers (22, 23, 24) is connected to said rollers (22, 23, 24) by means of a displacing mechanism (15 to 18, 30 to 33) adapted to move the rollers (22, 23, 24) into a squeezing engagement with the hose length in question when the support means (9) is turned in the fluid propelling direction and to pull said rollers (22, 23, 24) out of said engagement when said support means is turned in the opposite direction.

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Title: Hose pump

Technical Field

The invention relates to a hose pump comprising a housing with a circularly curving wall surface and a rotatable support means carrying a plurality of rollers, where said support means is adapted to press said rollers against the circular wall surface and to cause said rollers to propel a fluid through a hose, a length of said hose being arranged between the wall surface and the rollers, and where the support means of the rollers is connected to said rollers by means of a displacing mechanism adapted to move the rollers into a squeezing engagement with the hose length in question when the support means is turned in the fluid propelling direction and to pull said rollers out of said engagement when said support means is turned in the opposite direction.

Background Art

Hose pumps of the above type are known, whereby a pump medium is propelled through the hose by said hose being influenced in a peristaltic manner by a rotatable support means with rollers which press the hose against a circular wall surface within a hose length arranged against said wall surface. When the hose length has been positioned, the engagement of the wall surface, the hose and the rollers is established by either the housing carrying the wall surface or the support means with the rollers being displaced into the co-acting engagement.

US-PS No. 4,070,725 discloses a pump comprising a housing. A plurality of rollers are provided inside the housing, said rollers being supported by a support means and being guided by means of a guide member. The support means is forced to rotate by means of a handle. The support means is formed by two complemental sections receiving the rollers 14 therebetween, said rollers comprising their respective journals projecting from and being received in their respective helical slots in each section. The frictional

engagement with a hose between the rollers and the inner side of the housing has the effect that the rollers are pressed radially outward when the support means is rotated by means of a handle. As a result, the hose length is compressed.

Brief Description of the Invention

The object of the invention is to provide a relatively compact hose pump which allows an easy mounting of the hose in question and an easy activation of the pump.

As a result, a hose pump is obtained which renders it possible to cause the rollers to enter the squeezing engagement with the hose length in question while the pumping effect is initiated by a rotation of the support means. The easy disengagement of the rollers and the hose by a rotation in the opposite direction has the effect that it is easy to position the hose length along the circularly curving surface inside the housing, and the pumping effect is easily initiated by a rotation of the support means in the opposite direction.

According to the invention, the rotatable support means may be pivotally journalled on a fixed shaft centrally arranged inside the housing and the displacing mechanism may be a crank mechanism, where the support means forms the crank, and where each roller is rotatably arranged on a roller shaft which in turn is pivotally journalled on a connecting rod and engages a guideway, whereby a first stopping means is provided for retaining the rollers in a position in which each roller is in the squeezing engagement with the hose length in question when the support means is rotated, as well as a second stopping means for retaining said rollers in a position in which the rollers have disengaged the hose length in question when the support means is rotated in the opposite direction. As a result, the rollers disengage and engage the hose length in a reliable and simple manner by means of a crank mechanism, where the crank carries out the crank function during a portion of a complete rotation and subjects the roller shaft of the rollers to a stroke through the connecting rod. The latter stroke extends between two

positions which are spaced apart when seen in the radial direction in response to the shape and length of the guideway. The above stopping means ensure a limitation of the rotation of the support means relative to the rollers as well as cause the rollers to follow during a continued rotation of the support means in the position in which each roller has entered the squeezing engagement with the hose length in question. Although the pumping effect is briefly stopped, the rollers remain in the closing engagement with the hose.

The guideway may according to the invention advantageously be shaped in a guideway disc loosely arranged coaxially to the support means, and the stopping means may be fixedly connected to the guideway disc with the result that the function of the crank mechanism is ensured in a particularly simple manner.

Moreover, the stopping means may according to the invention be shaped as respective ends of a plurality of guide slits, a pin engaging each of these slits and being fixedly connected to the support means. As a result, the rotation of the support means relative to the guideway disc is controlled in a simple manner.

A uniform distribution of the load on the bearings forming part of the hose pump is ensured in a simple manner by a guideway disc being provided with associated guideway and stopping means at each end of the roller shafts. The uniform distribution of the load is further enhanced by a connecting rod being provided at each end of the roller shafts.

In this connection, the guideway discs may advantageously be interconnected.

Furthermore, the support means may according to the invention be fixedly connected to a handle by means of a plurality of pins extending parallel to the axis of rotation of the support means and engaging their respective sets of associated guide slits in the two guideway discs. As a result a simple control of the movement of the support means

relative to and together with the guideway discs is obtained while it is simultaneously possible to manually turn the support means.

According to the invention, the handle may be associated with locking means for releasably locking the rollers in the engagement with the hose length when said engagement has been initiated with the result that a release cannot erroneously be initiated of the engagement of the rollers with said hose length.

Finally, the support means may according to the invention be displaceable as a unit together with the rollers, the displacement mechanism thereof and the guideway discs between abutments on the shaft arranged centrally in the housing. In this manner the hose length in question can be arranged around the rollers in a particularly simple manner.

Brief Description of the Drawings

The invention is explained in greater detail below with reference to the accompanying drawings, in which

Fig. 1 illustrates a preferred embodiment of a hose pump according to the invention in a state in which the rollers are in a hose-squeezing state,

Fig. 2 is a sectional view of the embodiment of Fig. 1 taken along the line A-A of Fig. 1,

Fig. 3 illustrates on a larger scale the section framed by means of a line E in Fig. 2,

Fig. 4 illustrates on a larger scale the section framed by means of a line F in Fig. 1,

Fig. 5 is a sectional view taken along the line C-C in Fig. 2,

fig. 6 is a sectional view along the line B-B in Fig. 1,

Fig. 7 illustrates on a larger scale the section framed by means of a line D in Fig. 6,

Fig. 8 illustrates the embodiment of Fig. 7 in a state where the rollers have been removed from a hose-squeezing state,

Fig. 9 is a sectional view taken along the line A-A of the embodiment shown in Fig. 8,

Fig. 10 illustrates on a larger scale the section framed by means of a line F in Fig. 8,

Fig. 11 is a sectional view taken along the line C-C in Fig. 9,

Fig. 12 is a sectional view along the line B-B in Fig. 8, and

Fig. 13 illustrates on a larger scale the section framed by means of a line D in Fig. 12.

Best Mode for Carrying Out the Invention

The hose pump shown in the drawing comprises a housing designated the general reference numeral 1. This housing presents a cup-shaped form with a circular bottom wall 2 and a circular side wall 3 extending along the circumference of said bottom wall 2. The side wall is provided with a slot 4, and recesses 5 extend from said slot 4 in their respective circumferential directions, cf. Figs. 2, 9 and 12. These recesses 5 receive their respective ends of a length of a hose which is received in the hose pump during use. A shaft 7 is arranged at the centre of the bottom wall 2, said shaft projecting coaxially to the inner surface 8 of the side wall and into the interior of the housing. A support means 9 is rotatably arranged on the shaft 7. On the adjacent sides, the shaft 7 and the support means 9 comprise an abutment 10 and 11, respectively. These abut-

ments 10 and 11 are adapted to co-operate in such a manner that the support means 9 can be displaced between the position shown in Fig. 2 and the position shown in Fig. 9 in the axial direction of the shaft 7.

The support means 9 presents a triangular cross section when seen centrally relative to its axial extension and over most of its length, and immediately adjacent each corner of the triangle the support means 9 is provided with a pin 12, 13 and 14. These pins 12, 13 and 14 extend through and are secured to the support means in a manner not shown in greater detail, such as by means of locking rings. The pins 12, 13 and 14 support links 15, 16, 17 and 18 at each end of the support means when seen in the axial direction. Fig. 2 shows the two links 15 and 16 associated with the pin 12, whereas only the links 17 and 18 of the links associated with the remaining pins 13 and 14 are shown at one end of said pins 13, 14. The pair of links 15 to 18 associated with each pin 12, 13 and 14 are pivotally connected to the support means 9 through said pins 12, 13 and 14, whereas each pair of links are connected at the opposite end to their respective ends of a roller shaft 19, 20 and 21 associated with each pair of links. These roller shafts are provided with their respective pivotally journalled rollers 22, 23 and 24.

The support means 9 is at each end provided with a loosely arranged guideway disc 25, 26, which is secured to said support means 9 in a manner not shown in greater detail by means of for instance locking rings. The guideway discs 25, 26 are fixedly interconnected by means of retaining means 27, 28 and 29 with associated bolts or the like fastening means. The guideway discs 25, 26 are arranged with a predetermined clearance outside the rollers 22, 23 and 24 and the associated links 15, 16, 17 and 18 at each end of the support means 9. The guideway discs comprise opposing sets of radially extending guideways 30, 31, 32 and 33. The drawing shows only one of the sets of guideways 30, 31 positioned in their respective opposing discs, and the drawing only shows one of the guideways 32, 33 of the remaining two sets of guideways. The respective ends of the roller shafts 19, 20 and 21 engage these guideways. The guideway discs are furthermore provided with circumferential sets of guide slits 34, 35, 36 and

37. Fig. 2 shows only one set of axially opposing guide slits 34, 35, whereas only one guide slit 36, 37 is shown of each of the remaining two sets of guide slits. These guide slits 34, 35, 36 and 37 are engaged by each end of the pins 12, 13 and 14, respectively, extending through the support means 9.

The guideways 30, 33 and the guide slits 34, 37 are dimensioned such that the support means 9 and the associated links 15 to 18 and the rollers 23 to 24 function as a crank mechanism, where the support means 9 functions as a crank movable within an angular area due to the guide slits 34 to 37, said angular area being defined by the extension of said guide slits. The links 15 to 18 function as connecting rods, the end of which opposing the crank 9 is moved forward and backward in radial direction by the guideways 30 to 33 with the result that the rollers 22, 23 and 24 are also moved forward and backward in radial direction. The two outermost positions appear from the Figs. 1 to 6 and 8 to 12, respectively. The guide slits 34 to 37 and the guideways 30 to 33 are dimensioned such that the rollers 22, 23 and 24 co-operate with the inner surface 8 of the side wall 3 in the housing 1 in the radially outermost position so as to squeeze a hose (not shown) arranged therebetween. In this manner the rollers can initiate the desired pumping effect by a rotation of the support means 9. In the radially innermost position, cf. Figs. 8 to 12 and especially Fig. 9, the support means and the associated rollers 19, 20 and 21 and guideway discs 25, 26 can be pulled out of the housing 1 by a displacement on the shaft 7, and the hose in question can be removed from or placed on the rollers 22, 23 and 24.

As illustrated in the drawing, the rollers are provided with a circumferential flange 38, 39, 40, 41 and 42, 43, respectively, at each end, cf. for instance Figs. 2 and 5. One flange 39, 41 and 43 of these flanges is shaped with a large external diameter and adapted to co-operate with a circumferential groove 44 in the inner surface 8 of the housing 1. As a result it is ensured that the rollers and consequently the displaceable support means 9 with the associated parts are retained in position inside the housing in the state in which a length of a hose is fixedly squeezed between said rollers 22, 23

and 24.

An arm 45 is secured to the side facing away from the bottom wall 2 of the housing 1, said arm forming a crank lever together with a handle not shown. The arm 45 is secured to projecting ends of the pins 12, 13 and 14 secured to the support means 9 and allow a manual handling of the hose pump. A rotation of the crank lever implies that the support means 9 follows the rotation of the arm 45 into abutment against the ends of the guide slits 34 to 37. A clockwise rotation relative to Fig. 1 implies that the rollers 23, 24 are displaced radially outwards as mentioned by means of the crank mechanisms and guided by the guideways 30 to 33 until the pins 12, 13 and 14 abut the ends in question of the guide slits 34 to 37, optionally while the guideway discs 25 and 26 are manually retained. Subsequently, a continued rotation of the support means 9 through an activation of the arm 45 implies that the rollers are caused to follow the rotation through the guideway discs 25, 26 in such a manner that the desired pumping effect is obtained.

A releasable locking means shown at the reference numeral 46, cf. for instance Figs. 1, 4 and 6, is provided in order to ensure that the handle and consequently the arm 45 are not unintentionally rotated counterclockwise and the rollers 22 to 24 do not disengage the hose in question. This locking means 46 comprises a spring plate 47 which is mounted on the side of the guideway disc 26 which is placed adjacent the arm 45, said side facing the arm 46. As illustrated in the drawing, the spring plate 47 comprises an outwardly projecting member which extends away from the guideway disc 26 in question in the same direction as the one in which the arm 45 is rotated when it rotates clockwise. This projecting member is adapted to slide against the bottom side of the arm 45 when subjected to a biasing. This projecting member comprises an outwardly projecting flap 48 adapted to co-operate with a through hole 49 in the arm 45, said outwardly projecting flap also extending clockwise. A suitable positioning of the locking means 46 ensures that the flap 48 engages the hole 49 of the arm 45 when said arm 45 is in the state in which the rollers 22, 23 and 24 squeeze the hose together, cf.

Figs. 1 to 7. The locking means 46 exit the locking engagement with the arm 45 by the flap 48 being pressed out of the engagement with the hole 49, such as by means of a screwdriver.

When the locking means 46 has been released, the support means 9 can be rotated freely counterclockwise relative to the guideway discs 25 and 26, cf. Fig. 1, until the pins 12, 13 and 14 abut the opposite end of the respective guide slits 34 to 37. As mentioned, the support means 9 and the members connected thereto, such as the guideway discs 25 and 26 and the rollers 22, 23 and 24, can be pulled axially out of the housing 1, cf. Figs. 8 to 12.

At the ends the support means 9 is provided with circular steppings in order to ensure the free rotation of the guideway discs 25, 26 and the function of the links 15 to 18. The support means 9 and the links 15 to 18 connected thereto are dimensioned such that said links 15 to 18 are substantially radially directed relative to the central axis of the housing 1 when they are in the hose-squeezing state. As a result, the bearing pressure is radially transferred to the shaft 7 of the housing and the support means 9 is consequently not subjected to a torque, and at least not to a counterclockwise force, with the effect that the locking means 46 are not subjected to a too strong load.

The illustrated embodiment renders it possible to influence the hose over a relatively large portion of the circumference of the inner surface 8, and it is suited for a manual handling as said hose is positioned in a relatively easy manner and the rollers can disengage and engage the hose in question in a relatively easy manner. The displacing movement of the rollers is initiated by means of a mechanism corresponding to a crank mechanism.

Claims

1. A hose pump comprising a housing (1) with a circularly curving wall surface (8) and a rotatable support means (9) carrying a plurality of rollers (22, 23 24), where said support means is adapted to press said rollers (22, 23, 24) against the circular wall surface (8) and to cause said rollers (22, 23, 24) to propel a fluid through a hose, a length of said hose being arranged between the wall surface (8) and the rollers (22, 23, 24), and where the support means (9) of the rollers (22, 23, 24) is connected to said rollers (22, 23, 24) by means of a displacing mechanism (15 to 18, 30 to 33) adapted to move the rollers (22, 23, 24) into a squeezing engagement with the hose length in question when the support means (9) is turned in the fluid propelling direction and to pull said rollers (22, 23, 24) out of said engagement when said support means is turned in the opposite direction, c h a r a c t e r i s e d in that the rotatable support means (9) is pivotally journalled on a fixed shaft (7) centrally arranged inside the housing (1), and that the displacing mechanism (15 to 18, 30 to 33) is a crank mechanism, where the support means (9) forms the crank, and where each roller (22, 23, 24) is rotatably arranged on a roller shaft (19, 20, 21) which in turn is pivotally journalled on a connecting rod (15 to 18) and engages a guideway (30 to 33), whereby a first stopping means is provided for retaining the rollers (22, 23, 24) in a position in which each roller (22, 23, 24) is in the squeezing engagement with the hose length in question when the support means (9) is rotated in one direction, as well as a second stopping means for retaining said rollers in a position in which the rollers (22, 23, 24) have disengaged the hose length in question when the support means (9) is rotated in the opposite direction.

2. A hose pump as claimed in claim 1, c h a r a c t e r i s e d in that the guideway (30 to 33) is shaped in a guideway disc (25, 26) loosely arranged coaxially to the support means (9), and that the stopping means are fixedly connected to the guideway disc (25, 26).

3. A hose pump as claimed in claim 1, c h a r a c t e r i s e d in that the stopping

means are shaped as respective ends of a plurality of guide slits (34 to 37), a pin (12, 13, 14) engaging each of these slits and being fixedly connected to the support means (9).

4. A hose pump as claimed in claim 1, 2 or 3, c h a r a c t e r i s e d in that a guideway disc (25, 26) is provided with guideways (30 to 33) and stopping means at each end of the roller shafts (19, 20, 21).

5. A hose pump as claimed in claim 1, 2, 3 or 4, c h a r a c t e r i s e d in that a connecting rod (15 to 18) is provided at each end of the roller shafts (19, 20, 21).

6. A hose pump as claimed in claim 4 or 6, c h a r a c t e r i s e d in that the guideway discs (25, 26) are interconnected.

7. A hose pump as claimed in claim 6, c h a r a c t e r i s e d in that the support means (9) is fixedly connected to a handle (45) by means of a plurality of pins (12, 13, 14) extending parallel to the axis of rotation of the support means (9) and engaging their respective sets of associated guide slits (34 to 37) in the two guideway discs (25, 26).

8. A hose pump as claimed in claim 7, c h a r a c t e r i s e d in that the handle (45) is associated with locking means for releasably locking the rollers (22, 23, 24) in the engagement with the hose length when said engagement has been initiated.

9. A hose pump as claimed in claim 8, c h a r a c t e r i s e d in that the support means (9) with the handle (45) is displaceable as a unit together with the rollers (22, 23, 24), the displacement mechanism (15 to 18, 30 to 33) thereof and the guideway discs (25, 26) between abutments (10, 11) on the shaft (7) arranged centrally in the housing and the support means (9).

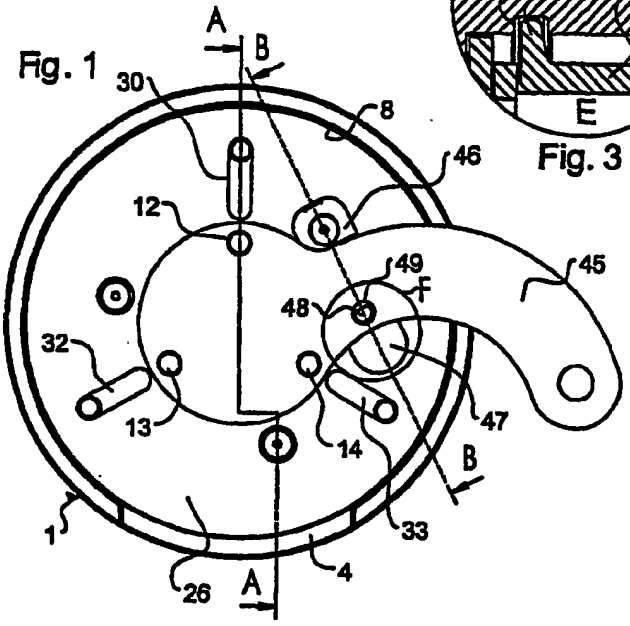


Fig. 1

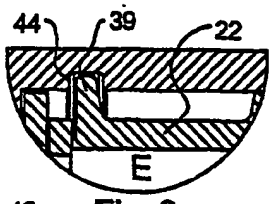
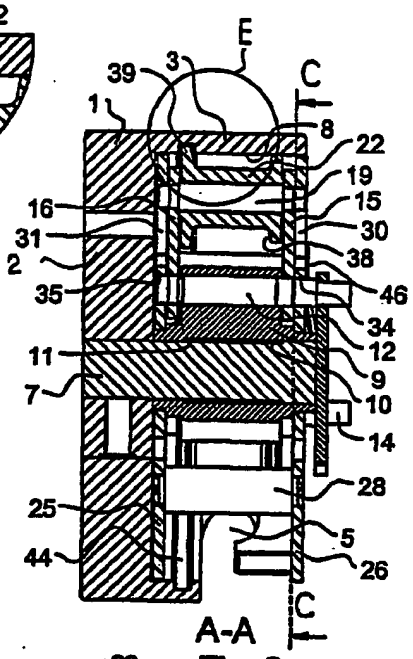


Fig. 3



A-A
Fig. 2

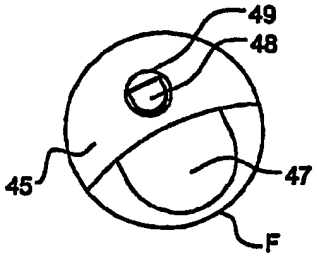
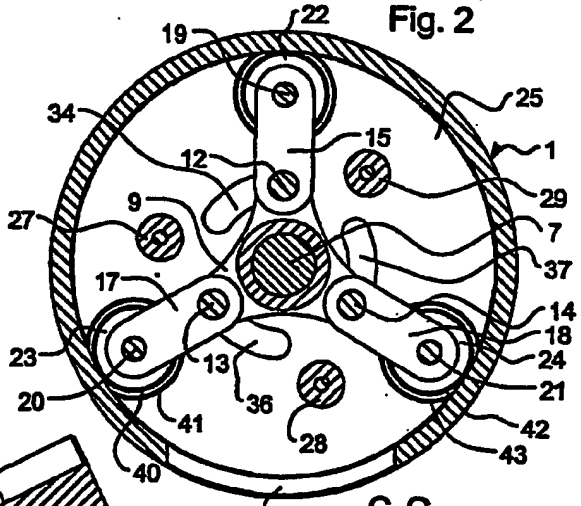


Fig. 4



C-C
Fig. 5

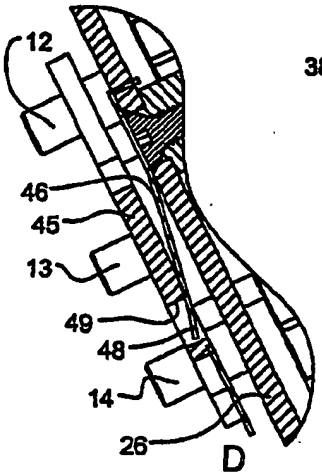
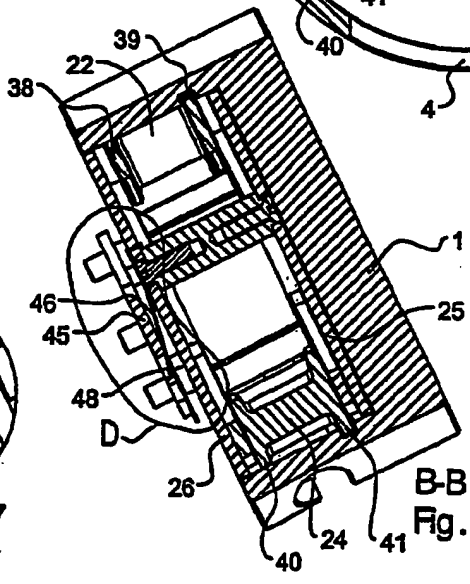


Fig. 7



B-B
Fig. 6

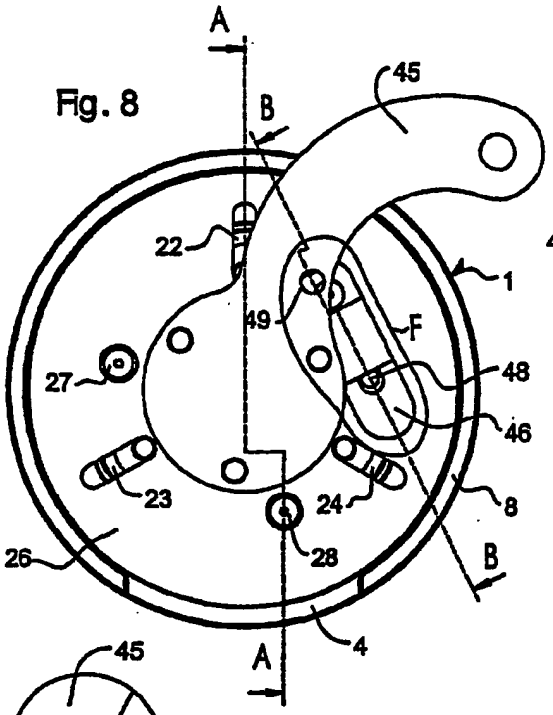


Fig. 8

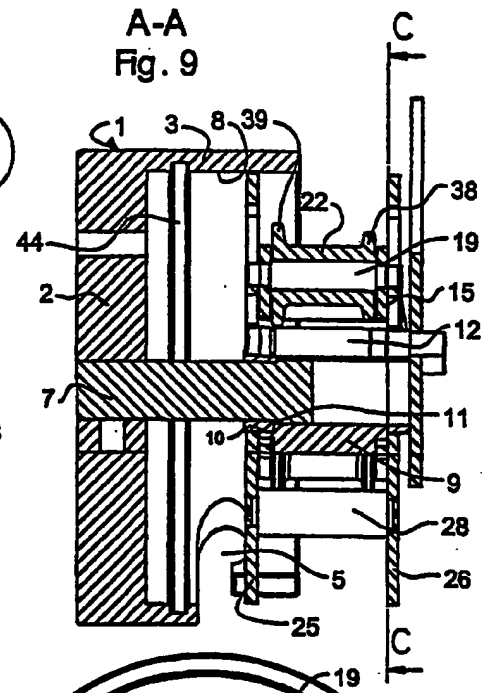


Fig. 9

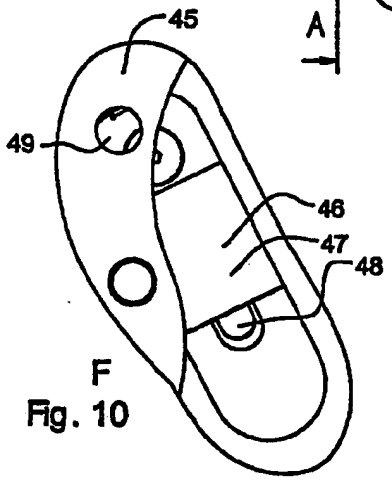


Fig. 10

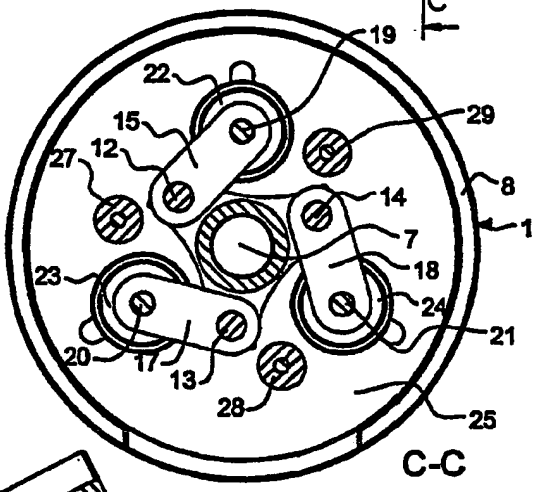


Fig. 11

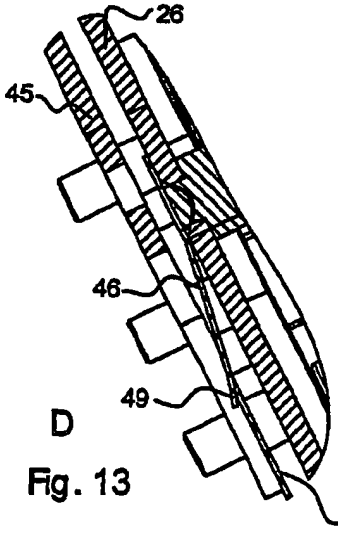


Fig. 13

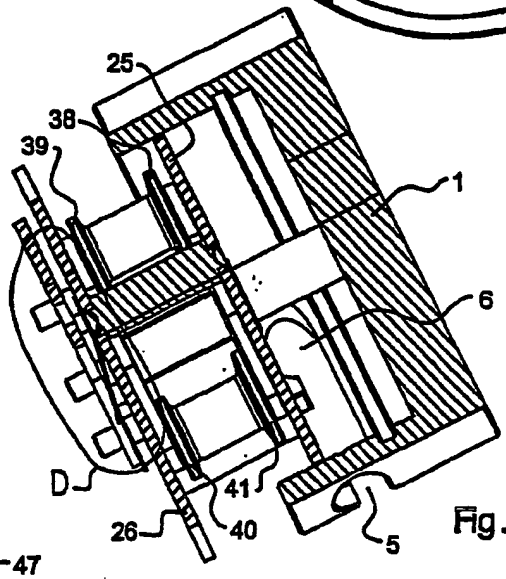


Fig. 12

INTERNATIONAL SEARCH REPORT

International application No.
PCT/DK 02/00113

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: F04B 43/12
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: F04B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-INTERNAL, WPI DATA, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4142845 A (LEPP ET AL), 6 March 1979 (06.03.79) --	1-6
A	DE 427746 C (ERNST POHL), 17 April 1926 (17.04.26) --	1
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17 May 2002	24.06.2002
Name and mailing address of the International Searching Authority European Patent Office, P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Authorized officer Sune Söderling / JA A Telephone No.

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INTERNATIONAL SEARCH REPORT

Information on patent family members

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